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(72) Inventors CHARLIE CLARENCE KILMER JR., and GEORGE JOSEPH LAURER

(54) CODED CARD

(71) We, INTERNATIONAL BUSINESS MACHINES CORPORATION, a Corporation organized and existing under the laws of the State of New York in the United States of America, of Armonk, New York 10504, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a coded card.

According to the invention there is provided a coded card exhibiting a substantially uniform transmissivity and surface reflectance in the visible light region comprising a first film and a second film laminated upon the first film, said films having different optical absorption characteristics at a substantially single frequency lying within an optical bandpass in the non-visible region and said card being encoded by either selectively aperturing the second film prior to lamination or laminating discrete portions of the second film upon selected areas of the first film.

It is well-known that the visible spectrum, as seen by the average human eye, extends from violet (wavelength of 0.38 microns) to red (0.78 microns). The eye is most sensitive to yellow-green (0.55 microns) which lies well within the violet-red range. Now, the infra red region especially in the 1.0 micron to 15 micron region is blessed with detectors such as gallium arsenide. Accordingly, the described embodiment contemplates a card transparent to light in the visible region and in at least one non-visible region such as infra red.

One flexible, tough thermoplastic having this spectral requirement is polyvinyl chloride (PVC) suitably permeable in the visible and infra red regions. The PVC bandpass transmission characteristic is substantially flat and non-absorbent from about 3.5 microns to about 7.0 microns. It was also observed that a carbonyl group attached to such a polymeric film structure would exhibit a near single frequency absorption characteristic well within the 3.5—7.0 micron range at 5.8 microns.

In the preferred embodiment, the card is formed from a film of PVC laminated onto a film of copolymer of vinyl chloride and vinylacetate (PVAC). The PVAC layer can be exceedingly thin. The indicia can be encoded onto the card by selectively aperturing the PVAC layer by punching holes before lamination. Upon lamination, the PVC is caused to fill the apertures. This renders the apertures optically indistinguishable in visible light. Alternatively the encoding can be accomplished by the deposition of PVAC strips onto discrete preselected areas of the PVC film by a rapid evaporation process.

It should be recalled that PVAC has substantially similar optical and physicochemical characteristics as PVC but for its discrete substantially single frequency absorption characteristic. This means that light illuminating the laminate in the visible region will be either passed through the structure or partially reflected from the surfaces uniformly. When the laminate is illuminated by light in the infra red region, a spectral difference is detectable only at substantially 5.8 microns.

Since PVC and PVAC are commercially available in sheet form lamination can be effectuated by placing respective sheets one upon the other between hot platens or calenders. Because the dwell time between the calender rolls is short i.e. about a second or less, a temperature above the melting temperature of approximately 250°C can be used. Note that in this form of lamination, there is only a small amount of plastic flow.

As previously mentioned, the best form contemplates that only the second film con-

tain the carbonyl groups. It is recalled from Beer's law that the amount of light absorbed is proportional to the concentration of the absorbing material. Consequently, if both films are of the same material and the second film has a significantly higher concentration or carbonyl groups than the first film, then there would still be a detectable spectral difference. This factor becomes of some significance in the practice of the invention in view of the commercial difficulty of obtaining carbonyl group free PVC. Illustratively, films frequently contain plasticizers, e.g., dioctyl phthalate or (di-2-ethyl hexyl phthalate), to maintain a degree of suppleness. This plasticizer contains as many as 2 carbonyl groups per mole. Likewise, polyaromatic stabilizers may be added to prevent polymer degradation. These also contain carbonyl groups.

In circumstances where it is desired to protect the coded indicia from alteration due to wear or accidental scratching, a PVC layer can be laminated on top of the second film forming a sandwich therefrom. Vacuum lamination, for example, avoids any trapping of gas bubbles.

Another example of a laminate according to the invention exhibiting a "notch frequency" in the infra red region is a card formed from polyethylene terephthalate and polyethylene.

Note, that the mechanical strength of the bond may vary as a function of the differences, if any, in the melting temperatures and whether the melting point is sharply defined. In the above cases, plastics having amorphous structures are used. In this actuation, a range of melt temperatures can be expected.

The first film may be formed of vinyl cyclohexane copolymer, vinylidene chloride copolymer, polyethylene glycol monolaurate, polypropylene oxide or polyisoprene, and the second film may be formed of vinyl chloride methacrylate copolymer, polyvinyl formal, polyvinyl propionate or polyvinyl pyrrolidone.

WHAT WE CLAIM IS:—

1. A coded car exhibiting a substantially uniform transmissivity and surface reflectance in the visible light region comprising a first film and a second film laminated upon the first film, said films having different optical absorption characteristics at a substantially single frequency lying within an optical bandpass in the non-visible region and said card being encoded by either selectively aperturing the second film prior to lamination or laminating discrete portions of the second film upon selected areas of the first film.

2. A card according to Claim 1, in which the first film has an optical bandpass transmission characteristic in the infra red region.

3. A card according to Claim 1 or 2, in which said films are formed from the same material and the second film includes a carbonyl group.

4. A card according to Claim 1 or 2, in which said films are formed from different materials and the second film includes a carbonyl group.

5. A card according to any one of Claims 1, 2 or 4, in which the first film is formed from polyvinyl chloride, vinyl cyclohexane copolymer, vinylidene chloride copolymer, polyethylene glycol monolaurate, polypropylene oxide, or polyisoprene and the second film is formed from a copolymer of vinyl chloride and vinyl acetate, vinyl chloride/methacrylate copolymer, polyvinyl formal, polyvinyl proprionate or polyvinyl pyrrolidone.

6. A coded identity card substantially as hereinbefore described.

M. S. CHAUDHRY,
Chartered Patent Agent,
Agent for the Applicants.

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